

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

--	--	--	--	--	--	--	--	--	--

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

PMT0201 – MATHEMATICS II
(Foundation in Information Technology)

14 OCTOBER 2019
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6 pages**, excluding the cover page and formula list.
2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the **answer booklet** provided. All necessary working steps **MUST** be shown.
4. You are required to write proper steps to obtain **MAXIMUM** marks.

FORMULAE LIST - PMT0201

$$\cos^2 A + \sin^2 A = 1 \quad \sec^2 A = 1 + \tan^2 A \quad \csc^2 A = 1 + \cot^2 A$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$\cos 2A = 2\cos^2 A - 1 = 1 - 2\sin^2 A = \cos^2 A - \sin^2 A$$

$$\sin 2A = 2 \sin A \cos A$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$2 \sin A \cos B = \sin(A + B) + \sin(A - B)$$

$$2 \cos A \cos B = \cos(A + B) + \cos(A - B)$$

$$2 \sin A \sin B = \cos(A - B) - \cos(A + B)$$

$$\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2} \quad , \quad \sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2} \quad , \quad \cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\sin \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{2}}$$

$$\cos \frac{A}{2} = \pm \sqrt{\frac{1 + \cos A}{2}}$$

$$\tan \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}} = \frac{1 - \cos A}{\sin A} = \frac{\sin A}{1 + \cos A}$$

$$s = r\theta \quad A = \frac{1}{2}r^2\theta$$

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$A = \frac{1}{2}ab \sin C$$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \quad , \quad s = \frac{1}{2}(a+b+c)$$

QUESTION 1 [10 MARKS]

- a) Figure 1 shows a sector ABC of a circle, with center A and radius 6 cm.

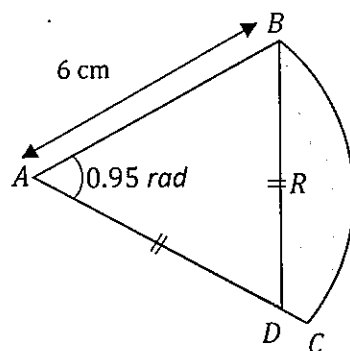


Figure 1

- i) Find the angle ADB in degree. [1 mark]
- ii) Find the length of AD . [1 mark]
- iii) Find the area of shaded region R . [3 marks]

- b) Find the exact value of $\cot \left[\sin^{-1} \left(\frac{2}{\sqrt{5}} \right) \right]$. Show all steps. [2.5 marks]

- c) Determine the amplitude, period, phase shift and vertical shift of the following function:

$$f(x) = -\frac{2}{5} \cos \left(2x + \frac{\pi}{4} \right) + 3 \quad [2.5 \text{ marks}]$$

Continued...

QUESTION 2 [10 MARKS]

- a) Solve $2\sin^2 \theta - 3\sin \theta - 2 = 0$ for $0^\circ \leq \theta \leq 360^\circ$. [3 marks]
- b) Express $2\sin \theta + 3\cos \theta$ in the form $R\sin(\theta + \alpha)$, where $0^\circ \leq \theta \leq 360^\circ$. [2 marks]
- c) Given $w = -\frac{1}{2} + \frac{\sqrt{3}}{2}i$.
- i) Find the **polar form** of w . [2.5 marks]
- ii) Given $z = \sqrt{3}(\cos 300^\circ + i\sin 300^\circ)$, find the polar form of $\frac{z}{w}$. [1 mark]
- iii) Use De Moivre's Theorem to find w^2 .
Leave your answer in the form $a + bi$ where $a, b \in \mathbb{R}$.
Express a and b in exact values. [1.5 marks]

Continued...

QUESTION 3 [10 MARKS]

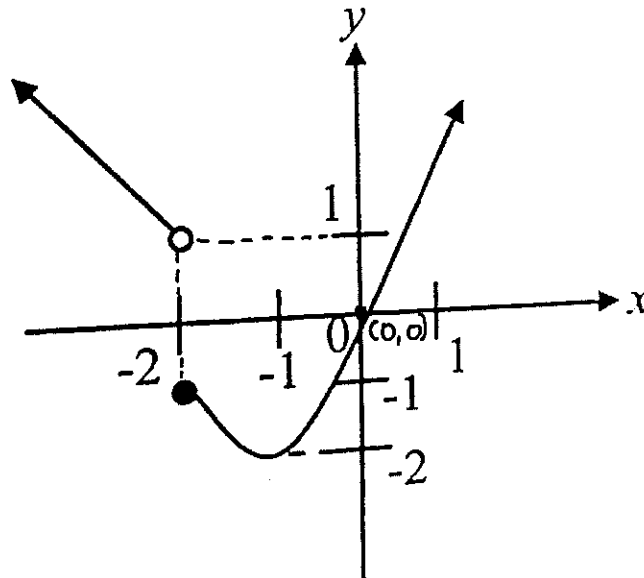
a) Evaluate the following limits:

i) $\lim_{x \rightarrow -2} \frac{4x+6}{5-2x}$ [1 mark]

ii) $\lim_{x \rightarrow 1} \frac{x^2 - 6x + 5}{x - 1}$ [2 marks]

iii) $\lim_{x \rightarrow 6} \frac{\sqrt{x-2} - 2}{x-6}$ [3 marks]

b) Use the graph of f below to find the following:



i) $\lim_{x \rightarrow -2} f(x)$

ii) $\lim_{x \rightarrow 0} f(x)$

iii) $\lim_{x \rightarrow -\infty} f(x)$

[1.5 marks]

Continued...

c) Given $f(x) = \begin{cases} x+2k & , \quad x \leq 1 \\ kx^2 + x + 1 & , \quad x > 1 \end{cases}$.

Find:

i) $\lim_{x \rightarrow 1^-} f(x)$

ii) $\lim_{x \rightarrow 1^+} f(x)$

Hence, find the value of k if $\lim_{x \rightarrow 1} f(x)$ exist.

[2.5 marks]

Continued...

QUESTION 4 [10 MARKS]

- a) Use **formal definition of derivative** to differentiate the function $f(x) = x^2$ with respect to x .

Hint: $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

[2.5 marks]

- b) Find the **first derivative** of the following functions:

i) $y = \frac{4x + 5x^4}{x^2}$

[1.5 marks]

ii) $y = (x^2 + 5x)^5$

[1 mark]

iii) $y = x^5 e^x$. Factorize your final answer.

[2 marks]

- c) Given $f(x) = x^3 - 12x$ for $-2 \leq x \leq 3$.

- i) Find the critical values.

- ii) Determine the absolute minimum and maximum values.

[3 marks]

Continued...

QUESTION 5 [10 MARKS]

a) Compute the integral $\int_1^2 \left(\frac{5}{x} + 2e^x \right) dx$.

Leave your final answer correct to two decimal places.

[2 marks]

b) Use **integration by parts** to find $\int (xe^{x+5}) dx$.

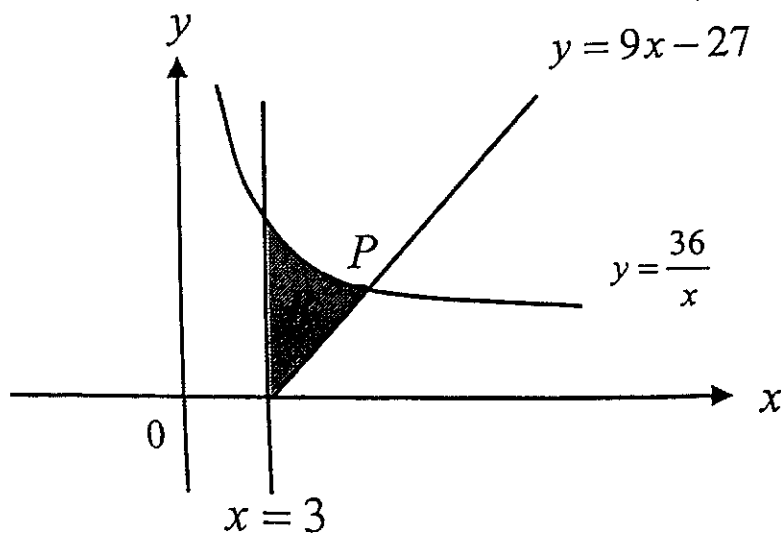
[2 marks]

c) Given $\int_1^5 f(x) dx = 6$.

Find the value of p if $\int_1^5 [f(x) + p] dx = 30$.

[2 marks]

d) The figure below shows a region R bounded by $y = \frac{36}{x}$, $y = 9x - 27$ and $x = 3$.



i) The curves $y = \frac{36}{x}$ and $y = 9x - 27$ intersect at P , show that the coordinates of P is $(4, 9)$.

ii) Find the area of shaded region R .

[4 marks]

End of Page.